




Adherence to healthy lifestyle recommendations in Brazilian cancer survivors

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Abstract

Purpose We aimed to describe the adherence to healthy lifestyle recommendations (regular consumption of fruits, vegetables, and salad greens; limit the consumption of red and processed meat, fast food, sugary and alcoholic beverages; keeping a healthy body weight, being physically activity, and not smoking) of 2314 cancer survivors and 86,517 adults without cancer diagnosis (general population) from the Brazilian National Health Survey, 2019.

Methods We developed a score including eight healthy lifestyle recommendations proposed by the World Cancer Research Fund (i.e., the score ranged from 0 to 8; being 0 did not follow any recommendation and 8 followed all recommendations).

Results Cancer survivors had higher healthy lifestyle score than the general population. In contrast, they presented similar adherence to the recommendations of physical activity, healthy body weight, and quitting smoking. Among cancer survivors, women (OR 1.52; 95%CI 1.12 to 2.06) and widows (OR 1.49; 95%CI 1.02 to 2.18) had greater odds of adherence to healthy lifestyle recommendations, adjusted for other sociodemographic characteristics. However, cancer survivors with complete primary education (OR 0.64; 95%CI 0.44 to 0.94) and higher education (OR 0.58; 95%CI 0.40 to 0.83) had lower adherence to the recommendations.

Conclusion Our findings may be useful to support counseling and interventions aimed at promoting healthy lifestyles for Brazilian cancer survivors.

Implications for Cancer Survivors Healthy lifestyle may reduce mortality and cancer recurrence, and improve quality of life in cancer survivors. Identifying factors associated with the adherence to healthy lifestyle in cancer survivors may be useful to support actions and interventions.

Keywords Healthy lifestyle · Cancer survivors · Cancer · Disease

Introduction

Approximately 19.3 million cancer cases (excluding non-melanoma skin cancer) and 10 million cancer deaths occurred worldwide in 2020 [1]. During the same year, in

Brazil, occurred 557,000 new cancer cases (excluding the non-melanoma skin cancer) and 257,000 cancer deaths [1]. The early detection and increasing success of cancer treatment have led to a significant increase in the number of cancer survivors in recent decades [2, 3]. In 2020,

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the number of prevalent cases of cancer (i.e., number of people with the disease in the last 5 years; also defined as cancer survivors) were 50 million worldwide and 1.5 million in Brazil [1].

Healthy lifestyles (healthy eating, regular physical activity, keeping a healthy body weight, not drinking and not smoking) have been associated with a lower risk of several types of cancer [4, 5]. In Brazil, approximately 27% of cancer cases and 34% of cancer deaths could be avoided if these healthy lifestyles were encouraged [6]. In addition, the World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR), which has been analyzing global evidence on how diet, nutrition, physical activity and body weight affect the survival of patients for more than 25 years, recommends adopting healthy lifestyles after cancer diagnosis [2, 3]. Several studies reported that cancer survivors who keep healthy lifestyle after cancer diagnosis have a lower risk of disease recurrence and mortality, as well as experience less fatigue and lower risk of developing other diseases, such as other types of cancer, cardiovascular diseases, and diabetes [7–9].

Previous studies have described the healthy lifestyles of cancer survivors. A descriptive study conducted in China showed that most cancer survivors adopted a healthy lifestyle by changing their eating behaviors and abstaining from smoking and alcohol [10]. Similar results were observed in a study conducted with Brazilians who had cancer diagnoses [11]. In contrast, a Canadian study showed that bladder cancer survivors did not follow the recommendations of healthy lifestyles [12]. Descriptive studies on healthy lifestyle in cancer survivors may provide useful information to support actions and interventions aimed at promoting health and quality of life among cancer survivors. However, these studies are scarce in the low- and middle-income countries.

In this study, we described the adherence to healthy lifestyle recommendations (regular consumption of fruits, vegetables, and salad greens; limit the consumption of red and processed meat, fast food, sugary and alcoholic beverages; keeping a healthy body weight, being physically active, and not smoking) of 2314 cancer survivors and 86,517 adults without cancer diagnosis (general population) from a Brazilian national representative survey. In addition, we examined the association between sociodemographic characteristics and adherence to healthy lifestyle recommendations (5–8 points in the WCRF score) among cancer survivors.

Methods

This study was conducted and reported according to STROBE guideline (Table S1).

Study population and sampling

We used cross-sectional data from the 2019 National Health Survey (*Pesquisa Nacional de Saúde*, PNS), a representative household survey conducted by the Ministry of Health and the Brazilian Institute of Geography and Statistics (IBGE), which aimed at assessing the health conditions, lifestyles and use of health services among a population aged 15 years or older in Brazil [13].

In the PNS sampling strategy, a complex multistage cluster sampling in three stages was used, with the census sectors as the primary sampling unit, the households as the secondary units, and the residents aged 15 years or older as the tertiary ones. We selected 100,541 households with residents randomly chosen for individual interviews, of which 94,114 agreed to participate (final response rate of 93.6%). Additional information on PNS sampling procedures were described elsewhere [13]. In this study, we included 86,517 adults (≥ 18 years old) without cancer diagnosis and 2311 cancer survivors (excluding 3 pregnant women).

Cancer diagnosis

Participants were asked if they were ever diagnosed with cancer and, if positive, the primary cancer location and their age at the first diagnosis. The following primary cancer were considered: lung, intestine, stomach, breast (for women), cervix, prostate, mouth, oropharynx or larynx, bladder, lymphoma or leukemia, brain, ovary, thyroid, and others. Time (in years) since the first cancer diagnosis was categorized into less than 10 years or equal or more than 10 years [13].

Assessment of healthy lifestyle factors

We analyzed information on the consumption of fruits, vegetables, salad greens, red and processed meat, sugary drinks, fast food and alcoholic beverage, as well as body mass index (BMI), physical activity and smoking. The selected healthy lifestyle factors were analyzed and categorized according to the WCRF recommendations [2]. The consumption of fruits, vegetables and salad greens (≥ 400 g per day) was evaluated according to the weekly frequency and the number of daily servings (0 to 3 or more times per day). We considered that each fruit, vegetable and salad green serving corresponds to approximately

80 g. The consumption of soda or sugary drinks (can/cardboard juice or powder juice) was evaluated according to the weekly frequency, in which we considered the non-consumption (0 to 1 day/week) as ideal. Limit the consumption of ultra-processed foods (0 to 1 day/week of cookies, fast food, snacks), red meat (< 3 days/week), and alcoholic beverages (no consumption) on the prior week were evaluated with weekly frequency questionnaire. We also considered not consuming any processed meat the day before the questionnaire. Participants were also asked about smoking, and we considered never smokers or former smoker as a healthy lifestyle. We evaluated the amount of physical activity based on the weekly frequency and duration (in minutes) of activities performed in leisure, transport, occupational and domestic domains, and we considered as recommended at least ≥ 150 min of physical activity per week. Body mass index (BMI) was calculated using self-reported weight and height, and we considered participants with BMI between 18.5 and 24.9 kg/m² as having a healthy body weight.

We developed a score corresponding to adherence to each one of the eight WCRF recommendations. The score ranged from 0 to 8, being 0 did not follow any recommendation and 8 followed all recommendations. We dichotomized the score: (1) did not adhere or adhered with the smallest part of the recommendations (0–4 points), and (2) adhered with the most or all of the recommendations (5–8 points).

Sociodemographic characteristics and reported morbidities

Information on sex (men and women), age (18–59, 60–75, > 75 years old), race/skin color (white, black/mixed and others), marital status (married, estranged/divorced, widowed, single), education level (incomplete elementary school, complete elementary school, complete high school and complete higher education) were assessed. We also included information from the self-reported diagnosis of other chronic non-communicable diseases (hypertension, diabetes, coronary heart disease, stroke, asthma, rheumatism, depression, lung disease, or chronic obstructive pulmonary disease (COPD), chronic renal failure).

Statistical analysis

Descriptive analyses were performed using prevalences and 95% confidence intervals (95% CI), and mean and standard deviation. We performed a logistic regression model to examine unadjusted and adjusted odds ratios (OR) and its respective 95% CI for the associations between

sociodemographic characteristics (sex, race/skin color, marital status and education level) of cancer survivors and the adherence to the WCRF healthy lifestyle recommendations. Sociodemographic characteristics were mutually adjusted in the multivariate model. All analyses were performed in Stata 17.0 considering the PNS 2019 complex sampling with the SVY command.

Ethics

The PNS was approved by the National Research Ethics Committee (CONEP) on August 23, 2019 under resolution nr. 3.529.376 and the participants signed a free and informed consent form.

Results

Cancer survivors with high adherence to the WCRF recommendations (5–8 points) were more likely women, older age, had lower education and a similar distribution of white race/skin color and married marital status as compared to cancer survivors who did not follow or followed the smallest part of the recommendations (0–4 points) (Table 1).

Regarding the healthy lifestyle recommendations, compared to the general population, cancer survivors had similar adherence to the recommendations of physical activity (19.3% of the cancer survivors vs. 22.0% of the general population), having a healthy body weight (36.9% vs. 39.7%) and quitting smoking (86% vs. 87.4%). In contrast, the proportion of cancer survivors who consumed ≥ 400 g per day of fruits, vegetables and salad greens was almost three times higher (4.3%; 95% CI 2.8 to 6.6) than in the general population (1.8%; 95% CI 1.6 to 2.0%). The proportion was also higher for the recommendations of limit the consumption of ultra-processed foods (40.9% cancer survivors vs 34.9% general population), red and processed meat (51.3% vs 43.8%), soft or sugary beverages (59.3% vs 49.3%), and alcoholic beverages (64.3% vs 57.5%) (Fig. 1 and Table S2). Overall, we observed that cancer survivors had higher scores in the WCRF recommendations than the general population (Fig. 2).

Participants diagnosed with stomach cancer had greater adherence to WCRF recommendations (56.7%), followed by those with brain cancer (46.2%), breast cancer (32.7%), and colorectal cancer (31.9%). On the other hand, most of the women with ovarian cancer (89.6%) did not follow the WCRF recommendations (89.6%). Similar results were observed for other types of cancer: mouth, oropharynx or larynx (79.2%), thyroid (78.4%), lymphoma or leukemia (76.7%), prostate (76.3%), and lung (75.9%).

Table 1 Sociodemographic characteristics of cancer survivors in Brazil according to WCRF recommendations, PNS 2019

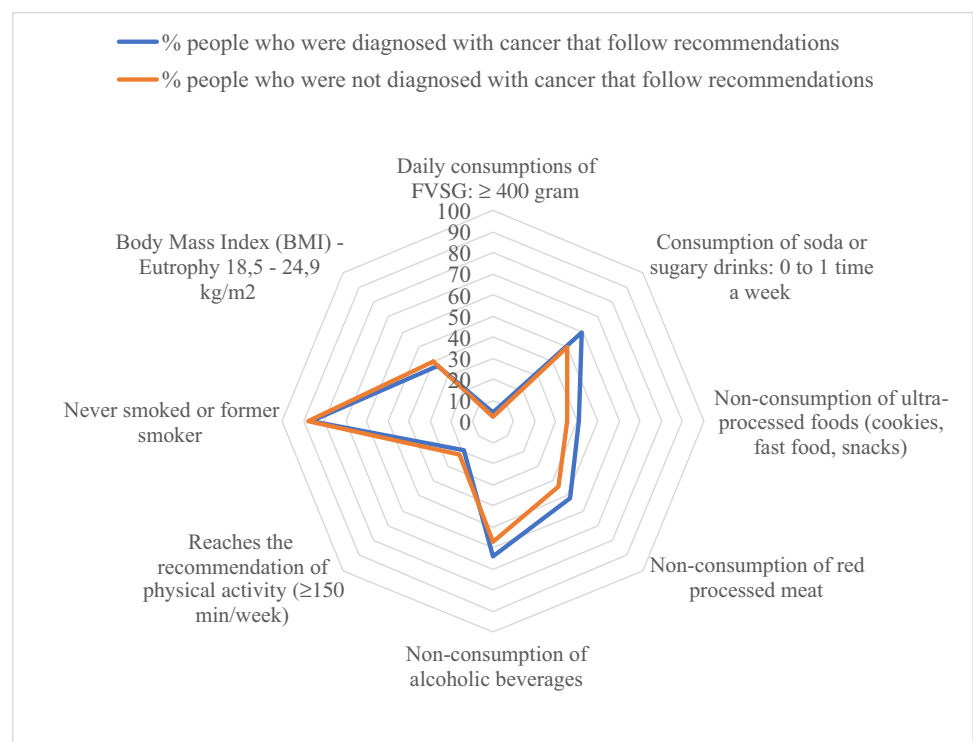
Variables	Cancer survivors	Cancer survivors with low adherence to WCRF recommendations (0–4 points)	Cancer survivors with high adherence to WCRF recommendations (5–8 points)
	(<i>n</i> =2311) %	%	%
Sex			
Male	41.7	44.3	34.8
Female	58.3	55.7	65.2
Age			
18–59	72.0	74.1	66.7
60–75	19.8	18.2	23.7
75+	8.2	7.7	9.6
Race/skin color			
White	52.4	52.8	51.4
Black/mixed	46.1	45.6	47.3
Others	1.5	1.6	1.3
Marital status			
Married	51.4	51.9	50.6
Estranged/divorced	9.9	9.6	10.4
Widowed	8.7	7.0	13.0
Single	30.0	31.5	26.0
Education level			
Incomplete elementary school	40.2	37.6	47.0
Complete elementary school	9.9	10.5	8.3
Complete high school	27.2	27.1	27.2
Complete higher education	22.7	24.8	17.5
Type of cancer			
Lung	3.8	4.0	3.2
Colorectal	5.1	4.9	5.8
Stomach	3.1	1.9	6.3
Breast (for women)	19.7	18.4	23
Cervix	12.9	13.1	12.4
Prostate	9.1	9.7	7.7
Mouth, oropharynx, or larynx	5.3	5.8	3.9
Bladder	2.0	2.0	2.1
Lymphoma or leukemia	6.5	6.9	5.4
Brain	2.2	1.6	3.6
Ovary	2.9	3.7	1.1
Thyroid	8.2	8.9	6.3
Others	11.1	12.1	8.7
Years since the first cancer diagnosis			
0–2 years	26.1	23.9	31.9
3–5 years	23.7	24.7	21.2
6–10 years	18.8	19.1	18.1
> 10 years	31.4	32.4	28.8
Other morbidities			
Hypertension	34.4	34.2	34.9
Diabetes	12.6	12.5	12.8
High cholesterol	22.7	21.8	25.2
Coronary heart diseases	11.7	13.4	7.3
Stroke	4.2	4.3	4.1

Table 1 (continued)

Variables	Cancer survivors (n=2311)	Cancer survivors with low adherence to WCRF recommendations (0–4 points)	Cancer survivors with high adherence to WCRF recommendations (5–8 points)
	%	%	%
Asthma	6.1	5.5	7.4
Rheumatism	13.7	13.7	13.8
Depression	18.6	21.0	12.2
Lung disease or COPD	3.7	3.8	3.3
Chronic renal failure	4.0	4.4	2.9
Other NCDs	9.7	9.4	10.5

WCRF World Cancer Research Fund, NCD non-communicable diseases, COPD chronic obstructive pulmonary disease

Fig. 1 Prevalence of adherence to WCRF healthy lifestyle recommendations in Brazilian cancer survivors and general population, National Health Survey, Brazil, 2020



Considering the time since the first diagnosis (Table 2), adherence to the WCRF recommendations was almost twice as high in women who were diagnosed with cervical cancer more than 10 years ago (39.8%) vs those who with less than 10 years of diagnosis (22.9%), and almost three times higher in women diagnosed with ovarian cancer for more than 10 years (28.9%) vs those who were diagnosed less than 10 years ago (8%). However, a lower proportion of adherence to WCRF recommendations was observed among participants with lymphoma or leukemia (37.9% < 10 years vs 12.2% ≥ 10 years), mouth, oropharynx, or larynx cancer (32.1% < 10 years vs 11.1% ≥ 10 years), and stomach cancer (64.9% < 10 years vs 34.4% ≥ 10 years).

Table 3 displays the associations between sociodemographic characteristics and adherence to the WCRF recommendations among cancer survivors. In the unadjusted model, women, middle-aged and elderly, widowed and those with incomplete elementary school had greater odds of adherence to the WCRF recommendations compared their respective counterparts. In the multivariable model with all sociodemographic characteristics mutually adjusted, women presented a 50% higher odds of adherence to the recommendations (OR: 1.5 95% CI 1.1 to 2.0) than men. Compared to married individuals, widows showed greater odds of adherence to the WCRF recommendations (OR 1.5 95% CI 1.1 to 2.2).

Fig. 2 Adherence (%) to the WCRF recommendations score* in cancer survivors and the general population in Brazil; PNS 2019. *The score ranged from 0 to 8, being 0 did not follow any recommendation and 8 followed all recommendations displayed in Fig. 1

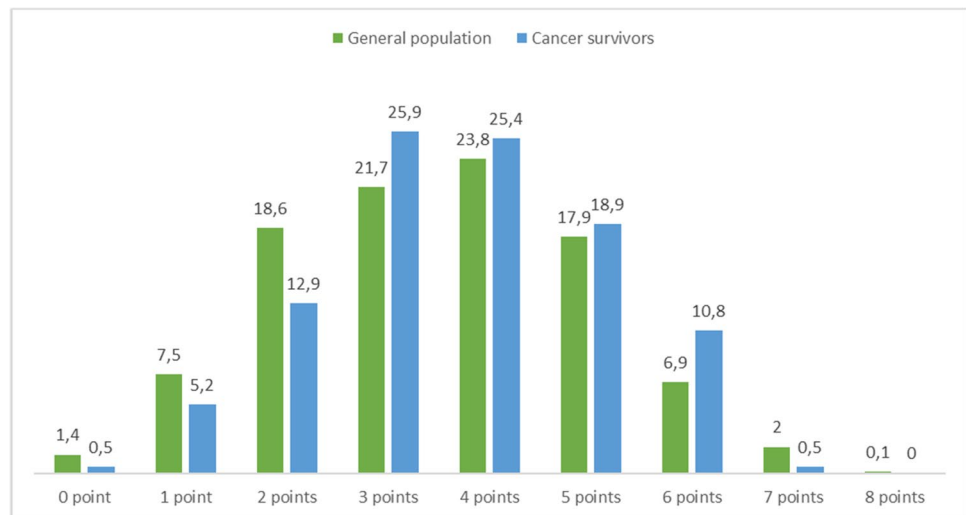


Table 2 Adherence to the WCRF recommendations in cancer survivors according to time since the diagnosis, PNS 2019

Variables	All cancer survivors		< 10 years since the diagnosis		≥ 10 years since the diagnosis	
	Low adherence to WCRF recommendations (0–4 points)	High adherence to WCRF recommendations (5–8 points)	Low adherence to WCRF recommendations (0–4 points)	High adherence to WCRF recommendations (5–8 points)	Low adherence to WCRF recommendations (0–4 points)	High adherence to WCRF recommendations (5–8 points)
Type of cancer	%	%	%	%	%	%
Lung	75.9	24.2	74.6	25.4	90.0	10.0
Colorectal	68.1	31.9	69.6	30.4	74.2	25.8
Stomach	43.3	56.7	35.1	64.9	65.7	34.4
Breast (for women)	67.3	32.7	65.7	34.3	67.5	32.5
Cervix	73.0	27.0	77.1	22.9	60.2	39.8
Prostate	76.3	23.7	71.3	28.7	71.2	28.9
Mouth, oropharynx or larynx	79.2	20.8	67.9	32.1	88.9	11.1
Bladder	71.5	28.5	64.7	35.3	63.8	36.2
Lymphoma or leukemia	76.7	23.3	62.2	37.9	87.8	12.2
Brain	53.8	46.2	58.5	41.6	46.2	53.8
Ovary	89.6	10.4	92.0	8.0	72.0	28.0
Thyroid	78.4	21.6	76.7	23.4	71.1	28.9
Others	78.1	21.9	72.5	27.5	89.3	10.7

WCRF: World Cancer Research Fund

Discussion

In the present study, we described some healthy lifestyle indicators of cancer survivors and general population in Brazil. In addition, we developed a score on healthy lifestyle based on the WCRF recommendations [2] and verified their association with sociodemographic characteristics among cancer survivors. We observed that cancer survivors

had higher scores in the WCRF recommendations than the general population. On the other hand, cancer survivors had similar adherence to the recommendations of physical activity, healthy body weight and quitting smoking as compared to the general population. Women and widows cancer survivors were more likely to adhere to the recommendations, whereas cancer survivors with complete elementary and higher education had lower odds of adherence to the recommendations.

Table 3 Association between sociodemographic characteristics and adherence to the WRCF recommendations among Brazilian cancer survivors

Variables	Unadjusted OR (95% CI)	Adjusted OR (95% CI)*	P value
Sex			
Male	1	1	
Female	1.49 (1.09 to 2.02)	1.52 (1.12 to 2.06)	0.007
Age group			
18–59	1	1	
60–75	1.44 (1.09 to 1.90)	1.22 (0.99 to 1.65)	0.202
75+	1.39 (0.98 to 1.97)	1.05 (0.69 to 1.59)	0.833
Race/skin color			
White	1	1	
Black/mixed	1.06 (0.83 to 1.35)	1.01 (0.78 to 1.31)	0.912
Others	0.80 (0.37 to 1.73)	0.75 (0.34 to 1.68)	0.490
Marital status			
Married	1	1	
Estranged/divorced	1.10 (0.70 to 1.73)	1.03 (0.64 to 1.66)	0.895
Widowed	1.91 (1.35 to 2.70)	1.49 (1.02 to 2.18)	0.039
Single	0.85 (0.62 to 1.16)	0.82 (0.61 to 1.12)	0.212
Education level			
Incomplete elementary school	1	1	
Complete elementary school	0.63 (0.44 to 0.92)	0.64 (0.44 to 0.94)	0.024
Complete high school	0.80 (0.55 to 1.18)	0.84 (0.57 to 1.24)	0.376
Complete higher education	0.56 (0.39 to 0.81)	0.58 (0.40 to 0.83)	0.003

OR odds ratio, CI confidence interval

*Multivariable model adjusted for all variables displayed in the table

Similar results were observed by Hoang et al. [14] while assessing more than 5000 cancer survivors who presented healthier diets (lower consumption of sugar and sweets, meat and poultry, oil and fat and beverages) than the general population. In contrast, another study indicated that cancer survivors had low adherence to dietary guidelines, and their intake patterns were worse than the general population [15]. In another cross-sectional study including 19,973 adults participants, of whom 1930 were cancer survivors, diet quality (intake of fruit and vegetables, grains, dairy products, meat and alternatives, snacks, desserts, non-diet soft drinks, fats, sauces) was similar between cancer survivors and general population [16]. A previous study also reported that a higher proportion of cancer survivors continued to smoke after being diagnosed with cancer [17].

A possible explanation for cancer survivors not fully adhering to healthy lifestyle recommendations may be related to the understanding on how this would improve their overall health and survivorship [18], financial problems [19], lack of access to support services, emotional stress, educational level [20], and primary cancer location and the treatment used. For instance, a multicenter study assessing the quality of life of head and neck cancer survivors found

that eating problems such as xerostomia and dysgeusia have worsened over time, which compromised their dietary quality and body weight [21]. In addition, the treatment of cancer patients is unfortunately often based only on pharmacological issues of the disease. However, it is extremely important that a shift towards a holistic patient-centered approach occurs, in which an integrative and multidisciplinary assistance would take place, integrating lifestyle (diet, physical activity), sleep, emotional, spiritual, social factors, and the caregiver–patient relationship [22, 23].

Adherence to healthy lifestyles after the cancer diagnosis is associated with a general health status improvement and lower risk of cancer recurrence. The potential mechanisms that explain such associations are broad and complex. For example, vitamins, minerals, phytochemicals, and fibers present in fruits, vegetables, and salad greens act by influencing cellular epigenetic processes, thus improving the prognosis [18].

Increasing evidence suggests that weight control and moderate to vigorous physical activity reduce the risk of morbidity and mortality among cancer survivors through improved immune function, total antioxidant capacity, reduction in systemic inflammation, oxidative stress, decrease in adipose tissue, and hyperinsulinemia [9, 24]. A recent study also showed that muscle-strengthening activities may reduce

cancer mortality, especially when combined with aerobic activities [25]. Not smoking nor drinking alcoholic beverages after the cancer diagnosis also represents an important opportunity to improve the health status in physical and psychological health of cancer survivors [26, 27].

Joint actions performed by multidisciplinary health professionals, family and the government may encourage the cancer survivor to adhere a healthy lifestyle. Educational and environmental interventions, whether individual or collective, are essential strategies for cancer survivors. These actions may assist cancer survivors adhere to healthy lifestyle recommendations, which are determined by several individual, environmental, and contextual factors.

Our study has some limitations that should be noted. Firstly, the healthy lifestyle were self-reported and, therefore, prone to misclassification bias of participants regarding the adherence to WCRF recommendations. In addition, although we include more than 2000 participants, the sample was not representative of Brazilian cancer survivors.

Conclusions

This study described some healthy lifestyle indicators recommended by the WCRF and observed differences between adherence in cancer survivors and the general population. It was also possible to identify sociodemographic characteristics of cancer survivors associated with greater adherence to WCRF recommendations. We observed that cancer survivors had higher adherence to the WCRF recommendations than the general population. In contrast, cancer survivors had similar adherence to the recommendations of physical activity, keeping a healthy body weight, and quitting smoking. Our findings may be useful to expand the secondary/tertiary prevention strategies and to encourage healthy lifestyles, aiming at greater effectiveness of clinical treatment and reduction of cancer recurrence, as well as other comorbidities. Identifying preferences and barriers to adherence to healthy lifestyles in cancer survivors may assist the implementation of these actions and programs.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s11764-022-01228-6>.

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Author contribution All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by BLM, JV, and LFMR. The first draft of the manuscript was written by BLM and LFMR and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Data availability The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval The PNS was approved by the National Research Ethics Committee (CONEP) on August 23, 2019 under resolution nr. 3.529.376 and the participants signed a free and informed consent form.

Consent to participate Informed consent was obtained from all individual participants included in the study.

Conflict of interest The authors declare no competing interests.

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